Engineering Specification of Injection Kicker PS (May 2000)

Input Voltage	460 Vrms 3 phase,+10%, -5%, 60 Hz
output Voltage	0 to +150 V, 0 to –800 V
Output Current	0 to +1400 A max. pulsed (400 Arms equivalent)
Pulse Repetition Frequency	60 Hz
Regulation mode	Current
Load Current Tracking	See Notes on next page
Load Current Fall Time	< 0.5 msec from 1400A to 0A
Load Current Slew Rate	>18000 KA/sec
Large Signal Current Response	>2 KHz at 45 deg. Phase shift at 1400A.
Current Error at Flat Top	< 0.1%
Output Voltage Ripple	< 0.1%, (20 Hz to 10 KHz)
	< 1% (10 KHz to 1 MHz)
Electrical Load	13 milli-ohm + 163 uH
DCCT	Danfysik 864-200 or equiv.
Ambient Air Temperature	10 to 40 degrees C
Maximum Inlet Water Temperature	40 degrees C
Size of Unit	5’ (W) 7’ (D) 7’ (H)

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1. The linear rise plus the flat top of the current reference waveform varies from 2 to 3 ms and, since the fall varies from 280 us to 1 ms, the worst case pulse width is 4 ms.

   The typical load-current tracking waveforms for the 2 kHz current regulated power supply are shown in figures 2 and 4. The fall time of the reference input in Fig. 2 is 280 us. Note that in this case, the tracking shall be such that the load current falls to less than 1.4A in less than 500 us. In Fig. 4, the reference input fall time is 500 us.

- Relationship between load current and load voltage is depicted in Fig. 3. The fall time for the reference input is 280 us and the load current falls to zero in less than 500 us. Note that the load voltage hits 800 volts.

- The small overshoot (if any) on the current waveform shall settle in less than 300 us.

- The part of the power supply that does the current regulation can be either a linear (transistor or IGBT bank) or a PWM switching (IGBT switching modules) regulator. Other scheme proposed by the vendor will also be evaluated.

- The pure delay at the beginning of the current waveform in Fig. 1 is 50 us.

- If the frequency of the voltage ripple is 360 Hz, the load impedance is 0.3817 ohm. The current produced by an 800-mVpp ripple is about 2A..

Current Response of Injection Kicker PS

Computer simulation of current response in the kicker magnet coil (top) and the corresponding voltage (bottom).

Red dash-doted line:

one of the desired exponential waveforms τ=0.3ms.

Green solid lines:

reference τ=0.3ms.

Blue dashed lines:

reference τ=0.2ms.